REMARKS

Claims 1-27 are pending in the application and stand rejected under Kuwabara (U.S. Patent No. 6,980,686 B2), and also in combination with Spaeth (U.S. Patent No. 2,349,012) or Lin, et al. (U.S. Patent No. 6,091,846).

Applicant traverses these rejections for the following reasons:

- The three Kuwabara thresholds are applied against different images/measurements rather than the same and therefore cannot be considered to collectively provide a range of values including upper and lower threshold:
    A. 1st threshold applied against image #1 (e.g. FIG. 8C), formed by subtracting delayed gray level image data (e.g. FIG. 8B) from original gray level image data (e.g. FIG. 8A) [Kuwabara, col. 8, lines 39-49];
    B. 2nd threshold applied against image #2 (e.g. FIG. 8E), formed by using AND operator against FIG. 8C and delayed FIG. 8D, to result in FIG. 8F [Kuwabara, col. 9, lines 1-26];
    C. 3rd threshold applied against image #3 (e.g. FIG. 10B), formed by difference between image FIG. 10A and those of +2 periods and -2 periods.
- Kuwabara does not use the raw datum to mark a target pixel as defective if the raw datum is within the threshold region. Instead, the candidate defect is "deleted from the defect candidate map." [Kuwabara, col. 10, lines 57-61]

Because of clear differences between the pending claims and the prior art of record, no amendments are considered necessary for allowance and none made. Consequently, Applicant requests reconsideration and allowance of the claims in light of the following remarks.

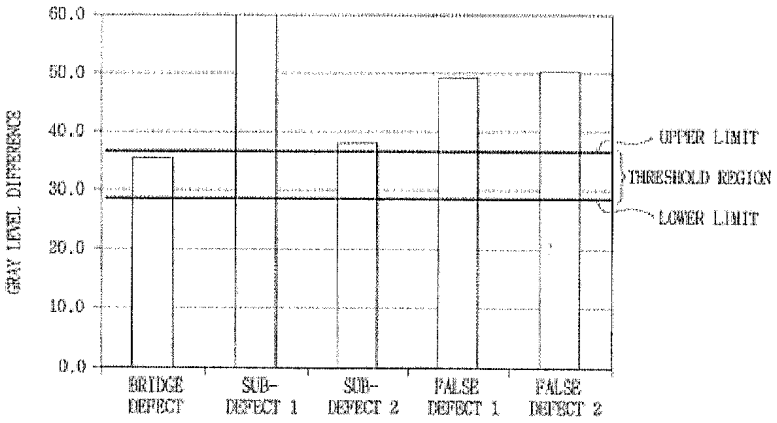
Comments Regarding Examiner's Arguments

The Examiner makes two comments in the beginning of the Final Office Action regarding remarks made by Applicant in a previous response. Applicant traverses.

A. Kuwabara does not teach an upper limit

The Examiner states that the plain meaning will be used to define the claimed "region" as a range of values. The rules state, however, that the claimed language (e.g. "threshold region") is to be read in light of the specification and the claims. FIG. 9 of the application explicitly

shows such a threshold region. The region is further claimed with "at least one pair of upper and lower limits" – again shown in FIG. 9.



Application, FIG. 9
Threshold region denotes range between two values

As best Applicant can determine, the Examiner argues that a threshold region is created by Kuwabara by the 1st threshold (e.g. a "lower limit") and the 2nd threshold (e.g. an "upper limit").

This analogy fails for two reasons.

First, the 1st and 2nd thresholds are compared against different images and do not form upper and lower thresholds against the same image. This would be like applying a lower weight threshold (e.g. 160 pounds) to a group of men [e.g. first image] and an upper weight threshold (e.g. 180 pounds) to a group of women [e.g. second image] and saying that the threshold range results in a collection of "people" between the lower and upper threshold. Instead, this application of the two thresholds would result in all men weighing over 160 pounds and all women weighing less than 180 (including those weighing under 160 pounds). The idea of threshold range therefore has no statistical meaning for the group "people," just as it would have no meaning for the group "defects."

In Kuwagara, the 1st threshold is applied against image #1 (e.g. FIG. 8C), formed by subtracting delayed gray level image data (e.g. FIG. 8B) from original gray level image data (e.g. FIG. 8A) [Kuwabara, col. 8, lines 39-49]. The 2nd threshold is applied against image #2 (e.g. FIG. 8E), formed by using AND operator against FIG. 8C and delayed FIG. 8D, to result in FIG. 8F [Kuwabara, col. 9, lines 1-26]. Because of the applications of the thresholds to different images, this is thus an apples to oranges comparison. Each of these Kuwabara thresholds are

only set to effect different steps of the candidate defect detection process. The end result is a set of lower thresholds, not a cohesive upper and lower threshold to define a range.

Second, there is no marking of the target pixel as defective if the raw datum is within a threshold region – that is, according to the Examiner, greater than the 1st threshold value but less than the 2nd threshold value. Instead, Kuwabara makes quite clear that the defect map generated from applying the 1st and 2nd thresholds **eliminates** the candidate if the 1st threshold is exceeded in one measurement but not exceeded (e.g. within the Examiner's range) in a 2nd measurement. This is shown below where candidates 62F and 63F, shown in FIG. 8E, are eliminated from consideration as defects (FIG. 8F) because their absolute values is less than the 2nd threshold value. [also, Kuwabara, col. 9, lines 22-26]

Fig.8E

SIGNED TWO-TIME JUDGED MAP

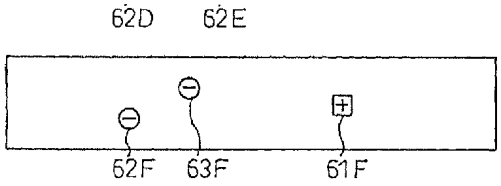
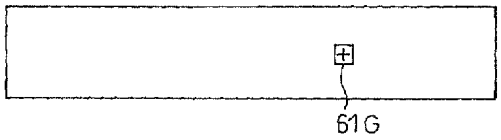


Fig.8F

DEFECT MAP



In this way, Kuwabara actually teaches away from the invention described in the claims.

B. Kuwabara does not compare the raw datum with the threshold region

The Kuwabara reference makes judicious use of the absolute values (e.g. **not** raw datum) of the gray levels of certain defect candidates:

- "In step 204, the ***absolute value*** of the signed differential image is compared with the first threshold value to obtain the part where the absolute value is greater than the first threshold value." [Kuwabara, col. 8, lines 43-46]
- "As for the defect candidates 62F and 63F with the other sign (in this case -), the ***absolute values*** of the signed differential images thereof provided in step 203 are compared in step 210 with the second threshold value that is greater than the first threshold value, and included among the defect candidates if the second threshold value is exceeded." [Kuwabara, col. 98, lines 15-21]

- "The part is left as a defect candidate when the ***absolute value*** of the third differential image is greater than a third threshold value, and left out of defect candidates, when less." [Kuwabara, col. 7, lines 7-10]

Kuwabara compares the absolute value, not the raw datum itself, to a threshold lower limit. Application of the absolute value amount to the threshold leads to the problems expressed in the Application FIG. 10 and accompanying text where killer and non-killer defects are undifferentiated. For example, and as stated on page 10, lines 22-31 of the Application, a killer striation defect in an S-poly patterning process is recognized as having a most likely gray level difference range between 20 and 60, which non-killer defects have gray level differences between about -20 and -60. If the threshold were applied to the absolute value of these measured amounts, then both types of defects are detected together and thus not differentiated.

C. *Kuwabara does not mark the target pixel as defective if within the threshold range*

To be maintained as a defect candidate using the Kuwabara method, a candidate defect in image #2 (e.g. FIG. 8E) would need to be greater than the 2nd threshold value in step 210 [Kuwabara, FIG. 7, also col. 9, lines 18-21] while a candidate defect in image #3 (e.g. FIG. 10B) would need to be greater than the 3rd threshold value in step 224 [Kuwabara, FIG. 11, also col. 10, lines 57-61]. The candidates for image #3 have already passed muster for image #2. Since the threshold $T_2>T_1$, and an example is given where $T_3=T_1$, then $T_2>T_3$. How then can the same defect be capable of both exceeding the 2nd threshold, yet not exceed (as is the case of nuisance-defect candidates) the 3rd threshold. The only reasonable answer is that the thresholds T_1, T_2, T_3 are for use with different images and cannot therefore be combined to form a threshold range.

More importantly, Kuwabara does not mark the target pixel as defective if within the threshold range. A proper defect-candidate under the Kuwabara analysis must satisfy each of these requirements: $>T_1$, $>T_2$, and $>T_3$. Since T_3 can be the 1st threshold value (T_1), and $T_2>T_1$, then a range would be $T_3 \rightarrow T_2$. This range makes no sense, however, since measurements above T_2 would still be counted as defects. T_2 therefore would not be considered a meaningful upper limit of any threshold range.

In light of these arguments above, the same remarks to the rejections are included below:

Claim Rejections – 35 U.S.C. § 102

Claims 1-2, 5-7, 9-10, 13, 15-21 and 24-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Kuwabara (U.S. Patent No. 6,980,686 B2).

Independent claims 1, 9 and 19 include the following limitations:

CLAIM 1:

- presetting a threshold *region including at least one pair of upper and lower limits*;
- comparing the threshold *region* with the raw datum; and
- marking the target pixel as defective if the raw datum is within the threshold *region.*

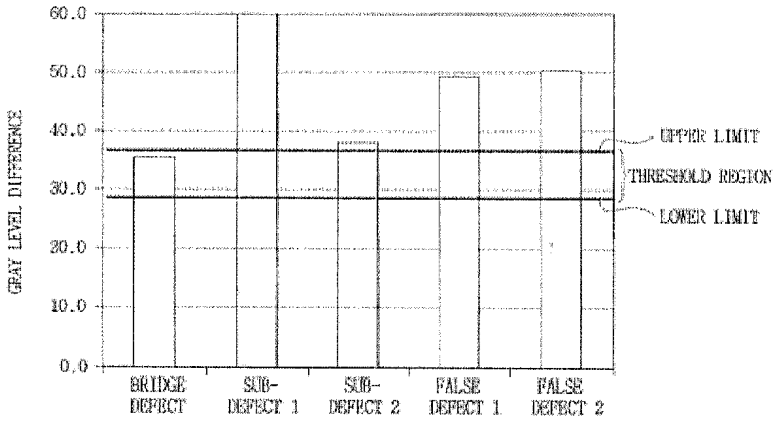
CLAIM 9:

- a setting unit for presetting a threshold *region, wherein the threshold region includes at least one pair of upper and lower limits*; and
- a judging unit for judging whether or not the target pixel is a defective pixel by comparing the raw datum of the target pixel with the threshold *region.*

CLAIM 19:

- presetting a threshold *region including at least one pair of upper and lower limits*; and
- comparing the raw datum with the threshold *region.*

Note that each of the independent claims set forth the step or apparatus carrying out the step of "presetting a threshold region . . . including at least one pair of upper and lower limits." The limitation "threshold region" can be understood by looking at Applicant's FIG. 9 (next page) where there is a lower limit and an upper limit bracketing a set of values.



Application, FIG. 9
Threshold region denotes range between two values

Kuwabara does not operate with a threshold "region including at least one pair of upper and lower limits." Instead, Kuwabara teaches a multistep testing process where the threshold (e.g., lower limit) is set to increasingly higher values. Kuwabara continually and consistently

speaks of comparing the absolute value of the gray level differential being "greater than" the first, second, and third values:

- In step 204 [FIG. 7], the absolute value of the signed differential image is compared with the first threshold value to obtain the part where the absolute value is ***greater than*** the first threshold value. [Kuwabara, col. 8, lines 43-46, *emphasis added*]
- The absolute values . . . are compared in step 210 [FIG. 7] with the second threshold value that is ***greater than*** the first threshold value, and included among the defect candidates if the second threshold value is exceeded. [Kuwabara, col. 9, lines 18-21, *emphasis added*]
- In step 224 [FIG. 11], whether the difference is greater than the third threshold value is judged . . . [and] if ***greater***, it is left in the defect candidate map in step 229 and step 211 is applied. [Kuwabara, col. 10, line 57 to col. 11, line 4, *emphasis added*]

Rather than teach a threshold region with an upper and lower limit, Kuwabara instead discloses using three sets of progressively higher lower limits where the only consideration is whether the gray level difference of the pixel tested exceeds the lower limit, not whether it falls within a range defined by the upper and lower limit. As Kuwabara fails to teach this element found in all pending claims, there can be no rejection of the claims under either §102 or §103 in the absence of such teaching.

Finally, and by way of example, the advantages realized through the invention of setting a threshold region that includes an upper limit is as follows:

> The threshold region for detecting the bridge defect, which is a killer defect generated during the NVM fabrication process, is defined by a lower limit that is identical to the conventional threshold value 30 and by an upper limit above which a sub-defect and a false defect are detected. Accordingly, a sub-defect and the false defect are not detected since the gray level differences of a sub-defect and a false defect are more than the upper limit.
>
> [Application, page 10, lines 7-12]

In contrast, Kuwabara treats as real defects only those that exceed each of the three threshold values. Accordingly, and because Kuwabara does not suggest using an upper limit to define a region, it would miss differentiating sub-defects and false defects from the real, killer defects.

A further differentiation is that the invention, as noted in the claims, compares the "raw datum" of the gray level difference with the threshold region. Kuwabara compares the absolute value, not the raw datum itself, to a threshold lower limit. Application of the absolute value amount to the threshold leads to the problems expressed in the Application FIG. 10 and accompanying text where killer and non-killer defects are undifferentiated. For example, and as

stated on page 10, lines 22-31 of the Application, a killer striation defect in an S-poly patterning process is recognized as having a most likely gray level difference range between 20 and 60, which non-killer defects have gray level differences between about -20 and -60. If the threshold were applied to the absolute value of these measured amounts, then both types of defects are detected together and thus not differentiated.

Claim Rejections – 35 U.S.C. § 103

Claims 3-4, 11-12 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (U.S. Patent No. 6,980,686 B2) in view of Spaeth (U.S. Patent No. 2,349,012).

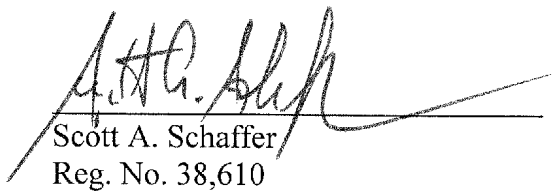
Claims 8, 14 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (U.S. Patent No. 6,980,686 B2) in view of Lin, et al. (U.S. Patent No. 6,091,846).

As neither Spaeth nor Lin disclose the use of a threshold range, then rejection of the claims under §103(a) fails as a matter of law.

For the foregoing reasons, reconsideration and allowance of claims 1-27 of the application as amended is requested. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

MARGER JOHNSON & McCOLLOM, P.C.



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